NAVY DUAL USE SCIENCE & TECHNOLOGY
BAA TOPIC AREAS for FY 2000

General questions concerning the Navy's DUS&T program may be posed to Cathy Nodgaard, (703) 696-0289, email: nodgaac@onr.navy.mil. Technical questions should be directed to the Government technical point of contact (TPOC) identified in the specific topic area. Additionally, this Commerce Business Daily notice can be accessed by clicking on Business Opportunities on the Office of Naval Research (ONR) homepage (Internet address: www.onr.navy.mil/02/BAA). You are encouraged to contact Helen Paul, the ONR Business POC, (703) 696-8665, email: paulh@onr.navy.mil to receive a copy of the ONR model agreement prior to submitting your proposal. If you are proposing in a topic area with a TPOC other than ONR, their model agreement may vary slightly from the ONR model.

Each project would be for two to three years with total Federal funding of up to $500K per year unless explicitly noted otherwise in the topic description.

Any interested company or institution should submit five (5) copies of the full proposals (technical and cost) by 1400 EDT 4 May 1999 to the Office of Naval Research, ATTN: Cathy Nodgaard, ONR 36, Room 633, 800 N Quincy St, Arlington, VA 22217-5660.

Any interested company or institution is encouraged, but not required, to submit a white paper synopsis of the planned DUS&T proposal including a rough cost estimate. The white paper should address the selection criteria wherever possible and must identify under which topic area it is being submitted. The white paper should not exceed five (5) pages and should be submitted by 30 March 1999. The white paper should be emailed to nodgaac@onr.navy.mil or mailed to the address indicated in the paragraph above. Those submitting white papers are encouraged to continue to draft a full proposal during the white paper evaluation process. The technical point of contact for the specified topic area will contact the white paper submitter and provide feedback on the level of interest in the proposed project. It is expected that feedback will be provided within 20 days. Based upon the degree of encouragement received, companies and institutions can better decide whether to continue the preparation of full technical and cost proposals for the described project. Offerors may submit full proposals without going through the white paper process.

AFFORDABLE SENSORS

ONR-32-1
TITLE: Littoral Mapping Through an Adaptive Network of Low-Cost, Multi-Purpose Autonomous Underwater Vehicles.
Develop and field-test an adaptive network of compact, autonomous underwater vehicles (AUVs) in a 10 km by 10 km coastal domain spanning the 10 m to 100 m depth range. The prototype network will utilize more than 5 mobile nodes (AUVs) to map in geophysical coordinates the three dimensional spatial gradients of sound speed to within a specified error and/or the three dimensional distribution of target objects to within a specified probability of detection (for the network). Over a ten day period, in-situ sampling by the AUVs will adapt in real time to maintain the specified error and/or probability limit distributions. Adaptation will be through feedback based on integration of measurements and models. **3-year duration proposals with the Federal share of funding being $2-4M per network per year. For this Topic academic-industry partnering is required.** (Tom Curtin, 703 696-4119, curtint@onr.navy.mil or Tom Swean, 703 696-4025, sweant@onr.navy.mil)

ONR-32-2
TITLE: Phased Array Weather Radar Technology.
Develop technologies for improved detection and processing of weather parameters using phased array radar systems including air traffic control or tracking radar systems. Proposals should address data assimilation issues and may include academic and federal laboratory partners. (Scott Sandgathe, 703 696-0802, sandgas@onr.navy.mil)

ONR-32-3
TITLE: Dual-Use Shallow-Water Observational Systems.
Develop and field a relocatable observational system, which provides real-time output, that can be used to establish local environmental conditions (acoustic and physical environments, bio-mass distributions, etc.) as well as provide a test range to evaluate the performance of Naval sonars and other underwater sensor systems, as appropriate. **2-3 year duration proposals with the Federal share of funding being $1-2M per year.** (Melbourne Briscoe, 703 696-4120, briscom@onr.navy.mil)

ONR-32-4
TITLE: Optimization of Ocean Optics, Remote Sensing and Underwater Acoustics for Biological Survey.
Develop and test a means to efficiently estimate oceanic bio-mass and trophic levels over broad ocean areas. (Melbourne Briscoe, 703 696-4120, briscom@onr.navy.mil)

ONR-32-5
TITLE: Dual Use of Integrated Undersea Surveillance System (IUSS).
Develop and test a means to provide unclassified access to classified undersea surveillance data streams in real or near-real time. (Steve Ramberg, 703 696-4358, rambers@onr.navy.mil)

ONR-31-1
TITLE: Application of Time-Frequency Signal Processing & Synthetic Aperture Radar (SAR) Technology to Magnetic Resonance Imaging (MRI).
Improve the spatial resolution of Synthetic Aperture Radar (SAR) & Inverse Synthetic Aperture Radar (ISAR) imagery of moving targets, and Magnetic Resonance Imaging (MRI) imagery of cardiac motion or other body organs blurred by breathing induced motion during the data collection. (William Miceli, 703 696-0560, miceliw@onr.navy.mil)

ONR 31-5
TITLE: Linear Wide-Band Vacuum Electronic Power Amplifier.
Develop an efficient, linear wide-band vacuum electronic amplifier technology. Advanced wideband electronic systems such as next generation multi-threat stand-off jammer pods require the simultaneous amplification of multiple signals covering a bandwidth of greater than two octaves while providing the highest possible overall efficiency (e.g., >35%). Amplifiers for multifunctional applications must also be of a form factor to fit in an electronically steered antenna array and signal delay variation in any one signal shall not be noticeably affected by the presence of another simultaneous signal. (Robert Parker 202 767-6655, nrl6840@estd.nrl.navy.mil)

ONR 31-6
TITLE: Compact MMW Power Amplifiers.
Develop millimeter wave vacuum electronic amplifier technologies that will be applicable to naval systems operating in the K-, Q-, and W-frequency bands. Applications include high resolution, all-weather imaging radar, secure communications, advanced electronic decoys, threat surrogates and simulators, as driver sources for high power fast-wave amplifiers and solid-state frequency multiplier arrays. The ability to implement millimeter-wave vacuum electronic amplifiers has been burdened by large size and weight, requirement for high voltage and/or high magnetic field, poor efficiency, and exceedingly high cost due to poor manufacturing yield. The work must address all of these burdens. (Robert Parker 202 767-6655, nrl6840@estd.nrl.navy.mil)

ONR 31-7
TITLE: Solid State UHF Amplifiers with High Power, Efficiency, and Yield.
Demonstrate the highest possible power density and efficiency for silicon carbide (SiC) power amplifiers in the UHF band in a physical format compatible with insertion into an electronically steered antenna array and at an acceptably low price when scaled to manufacturing quantities exceeding 20,000 per year. (Mun Fenton, 703 696-4202, fentonm@onr.navy.mil)

ONR 31-8
TITLE: Affordable Digital Receiver Technology.
Demonstrate affordable digital receivers in the UHF band. Demonstrate significant reduction in component count and size and weight. Develop digital receiver module that is less than 8 in^3 and 1.5 lbs per module. (Mun Fenton, 703 696-4202, fentonm@onr.navy.mil)

ONR 31-9
TITLE: Remote Sensor Applications for Environmental Data Collections.
Develop a compact, lightweight, airborne remote sensing suite consisting of a Synthetic Aperture Radar (SAR), a Passive Millimeter Wave Radiometer, a Light Detection and Ranging (LIDAR), and Visible Hyperspectral and Infrared Line Scanner sensors that are integrated and modular/palletized and independent of the host aircraft platform. (William Miceli, 703 696-0560, miceliw@onr.navy.mil)

ONR 31-12
TITLE: Wideband Materials for Future Navy Sensor Systems.
Large-area GaN substrates with low dislocation counts should enable high performance, high temperature and high power electronics (FETs and diodes) and optoelectronics (blue-ultraviolet detectors and lasers) important to the mission of the Department of Navy. Viable proposals should plan to deliver 2 inch diameter GaN substrates with a dislocation count of ~10^4/cm^2. Also, proposals should identify relationship of proposed tasks to future manufacturing technology efforts. (Chuck Caposell, 703 696-4814, caposec@onr.navy.mil)

ONR-33-9
TITLE: Sensors and Actuators:
Develop advanced high strain actuator materials with greater than 1% strain and coupling coefficients greater than 85%. New approaches involving ceramic and magnetic materials are of interest for high force actuators and broad band transducers. **$2M of Federal funding over 3 years.** (Wallace Smith, 703 696-0284, smithw@onr.navy.mil)

ADVANCED PROPULSION, POWER, AND FUEL EFFICIENCY

ONR-33-3
TITLE: Active Control of Combustion Processes.
Develop temporally and spatially controlled fuel modulation and other active combustion control methodologies, to precisely control the combustor performance in terms of meeting the part load operating conditions, and eliminate combustion-generated pressure oscillations. **$600K of Federal funding over 24 months.** (G. Roy, 703 696-4406, royg@onr.navy.mil)

ONR-33-1
TITLE: Turbine Development.
Develop advanced thermal propulsion systems requiring turbine engines for underwater vehicles - including blade cooling technology and turbine disk damping technology. **$800K of Federal funding over 24 months.** (K. Latt, 703 696-1474, lattk@onr.navy.mil)

ONR-33-5
TITLE: Safe, Affordable, High Specific Energy Rechargeable Batteries.
Develop safe, affordable rechargeable batteries with an initial specific energy goal of 200 Wh/kg and a longer-term goal of 400 Wh/kg by exploiting materials advancements in nonflammable electrolytes, solid-state polyelectrolytes, nanoscale electrode materials, nanomaterials processing, lithium-alloy anodes, and high capacity cathodes. **$250K of Federal funding per year for 3 years**. (Richard T. Carlin, 703 696-5075, carlinr@onr.navy.mil).

ONR-33-15
TITLE: Continuous Variable Pitch Propeller.
Develop an advanced continuous variable pitch propeller for marine applications. Such a propeller would be useful in littoral warfare and stealth applications as cavitation should be significantly reduced. The use of non-conventional actuators (such as magnetostrictives or other shape-changing material) as a component of a controllable and variable pitch propeller would allow adjustment to both the pitch and pitch profile of the propeller, allowing the propeller to more optimally match flow conditions at different speeds, beyond the single-angle adjustment in conventional controllable pitch propellers. Additionally, the elimination of gearing in the hub will reduce noise, increase reliability, and reduce the hub size. (Alan Schweber, (703) 602-2285 ext. 303, Schweber_Alan@hq.navsea.navy.mil)

ONR-33-16
TITLE: Electrically Reconfigureable Ship (ERCS) Technology.
ERCS is the key element essential for fulfilling NAVY AFTER NEXT mission which requires high performance platforms with flexible responses in battle conditions-survivability and flexibility in design. In the next few years, the Navy investment in Power Electronic Building Blocks, Automation, the Integrated Power System, Electronics Controls Systems, Electric Motors, and new generation plants will coalesce to enable the ERCS. The goals of the ERCS are three fold: Design Reconfigureability, Mission Reconfigureability and Dynamic Reconfigureability. Proposals may address these shipboard requirements as well as integrating the enabling Navy investments into coordinated shipboard operation. We are looking for both virtual and hardware prototypes demonstrating integration, control and coordination. We are looking for the adaptation of existing complex commercial environment to this problem. **$1M of Federal funding for 2 years. (**George Campisi, 703-696-7739, campisg@onr.navy.mil)

ONR-35-3
TITLE: Turbine Engine Propulsion.
Turbine engine propulsion technologies are needed that improve performance, reduce fuel consumption or reduce costs of Naval Aviation systems. The technologies must address the goals of the DoD/NASA Integrated High Performance Turbine Engine Technology (IHPTET) initiative. **$250K of Federal funding per year for 3 years.** (Rich Thaler, 301-757-0474, ThalerRR@navair.navy.mil)

ONR-35-4
TITLE: Aircraft Power (Distribution).
Current wiring in Naval Aircraft represents a significant cost and weight penalty. Light-weight affordable systems are required that are able to transmit power and control signals. It should also be electro-magnetic interference insensitive. Applications include communication control and power distribution for Naval aircraft. (Wayne Boblitt, 301-342-0808, BoblittWW@navair.navy.mil)

ONR-35-5
TITLE: Aircraft Power (Storage).
Technologies are required that result in high efficiency, light-weight, low volume, maintenance free, affordable batteries and chargers for Naval aircraft applications. (Wayne Boblitt, 301-342-0808, BoblittWW@navair.navy.mil)

INFORMATION AND COMMUNICATIONS SYSTEMS

ONR 31-2
TITLE: Mobile Augmented Reality.
Integrate Commercial off the Shelf wearable computer, visualization, wireless communications, and precision location technologies to permit unimpeded, free-roaming mobility supplemented by visual overlay of non-sensible information. (Larry Rosenblum, 202 767-5333, rosenblum@ait.nrl.navy.mil)

ONR 31-3
TITLE: Intelligent Information Retrieval.
Based on decision-maker's cognitive and task models, locate, filter, fuse, and display tactically relevant information stored at arbitrary networked repositories. (Michael Shneier 703 696-4303, shneiem@onr.navy.mil)

ONR 31-4
TITLE: Information System Interoperability.
Identify and devise technical means by which information in disparate, incompatible, information systems can be exchanged so that that users of each such system can transparently employ information from other systems. (David Jakubek 703 696-0872, jakubed@onr.navy.mil)

ONR 31-10
TITLE: Wireless Local Area Network Security and Management.
Develop a wireless local area network based on a commercial off-the-shelf IEEE 802.11 product with improved security and network management functions that reduce user personnel burden. (Jim Freebersyser, 703 696-0157, freebej@onr.navy.mil)

ONR 31-11
TITLE: K/KA-Band Phased Array Antennas for Mobile Platforms.
Develop technologies for significantly increasing the rates at which data can be delivered to/from/between mobile platforms via satellite communications using a K/Ka-band phased array antenna. (Jim Freebersyser, 703 696-0157, freebej@onr.navy.mil)

ONR-33-2
TITLE: Simulation Based Design (SBD).
Develop Intelligent Design Servers, that can automatically generate virtual prototypes, *including solid geometry*, in response to requests from other Intelligent Design Servers, or from users. Intelligent Design Servers can be implemented as software objects accessible over the internet. The inclusion of solid geometry will greatly increase the utility of the designs, but will also add significantly to the complexity of building Design Servers. ONR is developing Simulation Based Design (SBD) architecture that supports the acquisition of undersea weapons. The SBD architecture connects tools for automated design creation, cost estimation, and performance estimation, into a unified conceptual design environment. **$400K of Federal funding over 24 months.** (K. Latt, 703 696-1474, lattk@onr.navy.mil)

ONR 33-14
TITLE: Broadband Signal Processing.
Develop a capability for rapid generation of Wavelet Transforms on integrated/networked Power PCs. The capablity should be generic in the sense that the data block sizes could be changed and should handle input data rates up to 100kHz for a single channel. The architecture should allow expansion to multiple channels and should utilize COTS hardware and be implemented on cards no larger than 6U VME. **$500K of Federal funding over 24 months.** (K. Latt, 703 696-1474, lattk@onr.navy.mil)

MEDICAL AND BIOENGINEERING TECHNOLOGIES

ONR-34-1
TITLE: Bioengineering.
Reverse engineer human and other biological systems to uncover novel information processing architectures for pattern recognition and control (Jo Ann Breijo, 703 696-4053, breijoj@onr.navy.mil)

A. Automatic Pattern Recognition-Neural model-based sensor/processor networks for dynamic scene assessment, target detection/classification, and machinery fault diagnosis

1.) Automatic Target Detection/Recognition/Tracking. Models of insect/amphibian/cat/monkey visual systems have inspired image processor designs. Applications include moving target recognition algorithms for a missile seeker, camouflaged military vehicle detection in cluttered images, SAR imagery analysis via multi-spectral fusion, and video-based imagery analysis for real-time battlefield/urban surveillance.

Models of dolphin and bat active sonar systems have inspired sonar processor designs. Applications include detection of underwater mines from neural network analysis of sidescan sonar images and detection of buried mines from hybrid time-frequency neural network analysis of sonar return.

2.) Automatic Vehicle Control. Utilization of neural networks for guidance and control of a high speed vehicle and biomimetic controls and sensors for use in unmanned air vehicles.

B. Biorobotics-Biomimetic, Autonomous Vehicles and Mobile Robots

1.) Legged Locomotion. Apply principles of insect and crab locomotion to the design of mobile robots.

2.) Aquatic Locomotion. Apply principals of aquatic locomotion to robotic prototypes and evaluate applicability for propulsion and maneuver control on small underwater vehicles.

3.) Manipulation and Touch. Develop the utilization of genetically programmed controllers for dexterous manipulators and the employment of vibrotactile feedback for teleoperated manipulators.

4.) Collective Behavior. Develop a system to enable real-time, on-line learning of a control policy for coordinated, multi-robot behavior.

ONR-34-3
TITLE: Medical (Ed Marcinik, 703 692-4057, marcine@onr.navy.mil)

A. Combat Casualty Care - Human trials for various blood cellular components that have been preserved by freezing, freeze-drying or drying.

1.) There is a long-standing investment in the preservation of blood cellular components for Combat Casualty Care. In order to obtain FDA approval for these preserved cells, it is necessary to perform lengthy and expensive human clinical trials.

WEAPONS SYSTEMS SUSTAINMENT

ONR-33-4
TITLE: Innovative Acoustic Design.
Address acoustic design of system noise using innovative concepts, rather than the conventional passive, hybrid passive/active, and active control approaches. The concept should focus on reducing the acoustical source and energy production via optimization of operating parameters and system configuration, and/or converting the acoustical energy to a useful energy source. An example of acoustical energy conversion is using piezoelectric material to convert the acoustical (vibration) energy to electrical power. **$800K of Federal funding over 24 months.** (K. Ng, 703 696-0812, ngk@onr.navy.mil)

ONR-33-6
TITLE: Replace Hydraulics with Magnetostrictive Solid State Components.
Replace hydraulics with solid state components that exhibit the magnetostrictive effect. This would have four major benefits; 1) Higher instantaneous power output, 2) Greater speed of actuation or movement, 3) Increased component cycle lifetime and, 4) Elimination of environmental problems caused by hydraulic fluids. **$250K of Federal funding per year for 2 years.** (Phil Abraham, 703 696-4307, abrahaph@onr.navy.mil)

ONR-35-1
TITLE: Condition Based Maintenance Enabling Technologies.
Develop technologies to autonomously determine equipment component failures, the component failure modes and severity, based upon macro observables. Develop a prognostics capability based upon accurate and reliable diagnostics, coupled with state and environmental conditions, and physics based failure models. System designs must employ an open architecture, and be validated with failure data sets. (Dave Thurston, 703 696-4251, thurstd@onr.navy.mil)

ONR-35-2
TITLE: Reconfigurable Control Systems.
Develop technologies to reconfigure the flight control system of the aircraft following battle and mid-air collision damage or flight control failures. Approaches must take into account practical flight control issues such as actuator position and rate saturations, disturbances, and reasonable computer processing and memory requirements. Approaches shall be developed and demonstrated in simulation of a damaged high performance jet aircraft. **$150K of Federal funding per year for 3 years.** (Marc Steinberg, 301-342-8567, SteinbergML@navair.navy.mil)

DISTRIBUTED MISSION TRAINING

ONR-34-2
TITLE: Personnel Optimization.
Provide underpinnings for optimal use of human resources (Jo Ann Breijo, 703 696-4053, breijoj@onr.navy.mil)

Training Systems-Individual and team training systems based on cognitive models of learning and skill acquisition

1.) Instruction/Human Learning.
Develop Intelligent Computer Aided Instruction (ICAI) systems with learning capabilities. For example systems that are self-programming, learning the subject-matter expertise that they must have by having human experts demonstrate the solution of problems in the domain or systems that hone their instructional strategies by learning from experience with trainees, as human instructors do.

Develop cognitive models of learning to include a theory of complex learning that explains the processes by which such knowledge structures and complex cognitive processes are acquired and how they are built from or transformed from precursor states of less developed knowledge and skill.

Develop the capability for true natural language interaction in artificially intelligent tutors based on psycholinguistic research to understand the nature of highly effective human tutorial interaction and computational linguistics research to develop the capability to emulate that type of interaction.

Develop software technology to support authors in the cost-efficient production of artificially intelligent training systems.

Investigate the comparative value of alternative instructional strategies and human tutoring behavior.

2.) Training Delivery.
Develop effective embedded training systems to support shipboard requirements.
Develop principles for effective multimedia design.
Integrate Virtual Environment (VE) interfaces with ICAI instructional control.
Develop methods to deliver training via Internet and Intranet.

3.) Team Training.
Develop performance models and metrics for teamwork/taskwork.

Extend cognitive modeling to teams and develop cognitive models for synthetic team members and adversaries that react similar to live team members and adversaries.

4.) Training Evaluation.

Develop automated after exercise evaluation methods/formats.
Develop improved computer based end-of-course testing.
Develop automated performance assessment as a component of training systems.

B. Human Factors - Cognitive Model-Based Decision Support Systems and Interactive Human-System Interfaces

1.) Decision Support.

Utilize neural net models in Decision Support Systems as a means to conduct classification.

Incorporate cognitive models of explanation based reasoning and naturalistic decision making in Decision Support Systems.

Develop hybrid symbolic/neural net models of tactical decision making for incorporation in Decision Support Systems.

Develop Decision Support Systems to facilitate distributed and collaborative mission planning and execution.

2.) Information Presentation

Develop adaptable workstation hardware, software, and ergonomic architecture that accounts for the needs of varying team sizes adapted to the mission activity.

Develop guidelines for the multi-modal use of touch and speech input in combination with flat panel displays to best exploit these technologies for a variety of mission activities in future Command, Control, Communications, Computers and Intelligence systems.
Investigate the feasibility of applying 3-D audio output to improve the transfer of information via aural modality.

Develop a multi-modal workstation design that incorporates flexible display surfaces and controls to maximize effective human interaction.

3.) Human Centric Design

Develop theories/models for reconfigurable Command and Control (C^2) organizations and utilize computational models for matching C^2 organizations to dynamic mission needs.

Use computational models of the human performer to provide a scientific foundation for the cognitive engineering of effective human-system interaction.

Incorporate Human Performance Models in the design and development of new ship systems.

Develop a methodology to enable the dynamic allocation of functions between humans and automated systems.

C. Manpower/Personnel - Put the right person with the right training at the right place at the right time at the lowest possible cost

1.) Selection and Classification.
Develop new cognitive (spatial ability, time-sharing ability, perceptual speed) and non-cognitive (personality, social intelligence) measures; assess the magnitude of the contribution of these new measures with respect to job proficiency, promotion, and retention.

2.) Personnel Planning and Policy Analysis.
Use advanced statistical techniques (e.g., Artificial Neural Networks, Structural Equation Modeling), hybrid optimization, simulation, expert systems approaches, rule based forecasting, fuzzy logic and other allocation and optimization technologies to develop an automated tool for analyzing the impact of alternative accession sources and retention policies on costs and force structure.

Incorporate allocation and optimization technologies in crew composition models.

Develop methodologies for creating performance-based estimates of personnel readiness.

3.) Full Spectrum Models. Conceptualize and demonstrate new technologies applicable to future Navy manpower, personnel and training management systems.

(a.) Database/Information Exploitation: Review and evaluate data integrity, data mining, data visualization and information exploitation technologies for applicability to manpower, personnel and training management systems.

(b.) Intelligent Software Agents: Cognitive software agents to allow Sailors to apply for an array of available jobs, get real-time descriptions of those jobs and their locations, and exchange e-mail with their detailer to ask for additional information, do career planning and negotiate their assignments.

4.) Knowledge Management Systems: Enhance the effectiveness of the personnel business by providing access to a library of “knowledge clips” of corporate memory, a knowledge management library will allow best practices to improve over time and thereby strengthen the efficiency of the organization. One goal is to increase the proficiency of a new BUPERS arrival from months to weeks.

ADVANCED MATERIALS AND MANUFACTURING

ONR-33-7
TITLE: Advanced Composite Materials.
Develop new processing methods and procedures for polymer matrix composites and new carbon and glass reinforced polyurethane materials. **$3M of Federal funding over 3 years.** (James Kelly, 703 696-0688, kellyj@onr.navy.mil)

ONR-33-8
TITLE: Process Control for Welding.
Develop innovative process control methodologies with the goal of providing more affordable and environmentally compliant welding of structural alloys, as well as enhanced structural integrity / weld reliability. This is intended to include weld processes (such as friction stir welding and laser welding) that may have potential to significantly mitigate the presence of hexavalent chromium in weld fume which otherwise would accrue in conventional welding of chromium-bearing alloys (e.g. stainless steels). **$1M of Federal funding over 3 years.** (George Yoder, 703 696-0282, yoderg@onr.navy.mil)

ONR-33-10
TITLE: Ferrites for Radar Applications.
Develop techniques to deposit high quality, low-loss ferrite films on suitable substrates to allow monolithic integration of devices such as circulators, filters and phase shifters into radar modules. Benefits would include reduced size and weight as well as reduced cost for both military and civilian radars. **$1M of Federal funding over 3 years.** (Kristl Hathaway, 703 696-0888, hathawk@onr.navy.mil)

ONR-33-11
TITLE: Nanometer Materials and Other Coatings for Zero Maintenance.
Develop advanced processes and materials for high strength, fracture resistant, and wear resistant coatings. Such processes should be capable of being implemented in repair procedures in ship yards for components such as shafts, seals, gears etc. **$2M of Federal funding over 3 years.** \(Larry Kabacoff, 703 696-0283, kabacol@onr.navy.mil)

ONR-33-17
TITLE: Cost Effective Fabrication Processes for Aerospace Applications.
Develop novel, cost effective fabrication processes for aircraft/missile engines, structures. Such processes should be capable of fabricating structures more rapidly, cheaper and which have multifunctional capabilities. **$2M of Federal funding over 3 years**. (Steven Fishman, 703 696-0285, fishmas@onr.navy.mil)

ENVIRONMENTAL TECHNOLOGIES

ONR-33-12
TITLE: Alternative Fouling Control for Heat Exchangers.
Develop an affordable, advanced, non-polluting, biofouling control technology for heat exchanger as an alternative to chlorination. The focus is to either eliminate biofouling or to develop easy release coatings that will require minimal maintenance. **$150K of Federal funding per year for 3 years.** (Alex Lardis, 703 696-4311, lardisa@onr.navy.mil).